

Attorney Docket: 6550-000013
Serial No. 09/114,665

REMARKS

Applicants have amended Claims 1-7 and added new Claims 20-25. Basis for the amendments and the new claims can be found throughout the specification and originally-filed claims, specifically page 7, lines 5-20 and page 9, lines 13-17.

ELECTION OF INVENTION

The Examiner has requested restriction under 35 U.S.C. §121 to one of the following groups:

- I. Claims 1-16, drawn to a method for producing an *in situ* composite solder;
- II. Claims 17-19, drawn to a composite solder.

Applicants provisionally elect, with traverse, Group I, Claims 1-16, drawn to a method for producing an *in situ* composite solder having an intermetallic phase. Applicants preserve the right to prosecute the claims of Group II at a later date.

Applicants submit that the restriction required by the Examiner is improper because the methods of Claims 1-16 and the product of Claims 17-19 are not independent of each other. The methods of Claims 1-16 cannot be used to make other and materially different products. The methods are directed toward making an *in situ* composite solder in which the intermetallic particle size is fine, preferably about 10 microns or less. One using the methods of Claims 1-16 would obtain such a product. Alternatively, there are no methods disclosed in the prior art to produce an *in situ* composite solder with the properties obtained from the claimed methods.

Applicants therefore, request withdrawal of the restriction.

Attorney Docket: 6550-000013
Serial No. 09/114,665

SPECIFICATION

The Examiner has objected to the specification because the brief description of the drawings for Figures 1-3 does not comply with 37 C.F.R. §1.74. Applicants have amended the specification to include a brief description for each sub-figure, thus rendering the objection moot.

35 U.S.C. §112

The Examiner has rejected Claims 2-16 under 35 U.S.C. §112, second paragraph, as being indefinite. Applicants respectfully traverse and request reconsideration.

The Examiner states that Claims 2-5 are indefinite because the phrase "the solder matrix" has no antecedent basis. In an effort to expedite prosecution of this case, but in no way conceding to the validity of the Examiner's rejection, Applicants have amended Claims 2-5 to remove the word matrix. The claims now recite "the solder", referring to the solder in Claim 1 step a). Thus amended Claims 2-5 are definite and Applicants request withdrawal of the rejection.

The Examiner also believes that Claim 7 is indefinite because the volume ratio is unclear. In an effort to expedite prosecution of this case, but in no way conceding to the validity of the Examiner's rejection, Applicants have amended Claim 7 to recite "*the components* of the intermetallic phase comprise about 20 volume % of the composite solder" (emphasis added). Applicants thus submit that the volume ratio in the amended claim is clear and definite and request withdrawal of the objection.

Attorney Docket: 6550-000013
Serial No. 09/114,665

35 U.S.C. §102

The Examiner has rejected Claims 1-6, 8, 9, 14, and 15 under 35 U.S.C. §102(b) as being clearly anticipated by U.S. Patent No. 5,527,628 to Anderson et al. Applicants traverse and request reconsideration.

In order for the Anderson et al. reference to anticipate the claims of the present invention, the reference must disclose every element set forth in the claims. Applicants submit that the present invention is not anticipated by the Anderson et al. reference because the reference fails to disclose at least two elements of the claims of the present invention, namely the addition of the components of an intermetallic phase to a solder and rapidly cooling the melt of the mixture of the solder and components of the intermetallic phase.

The Anderson et al. reference discloses a tertiary eutectic solder without the addition of the components of an intermetallic phase to the solder. The reference does not disclose, teach or suggest the claimed method of the present invention for producing a *composite* solder having an intermetallic phase in which the components of the intermetallic phase are added to a solder. The solder can be any solder, including the ternary eutectic solders described by Anderson et al. (*see*, page 7, lines 24-26).

Furthermore, the Anderson et al. reference does not disclose, teach or suggest rapidly cooling the melted solder elements, nor that it would be advantageous to do so. Applicants have discovered that rapidly cooling the heated, non-solid mixture of the solder and the intermetallic phase components produces a composite solder that provides greater ductility, creep resistance and strength in the solder joint. Rapidly cooling is defined in the specification as cooling at a rate of at least 100 °C/ (see, page 7, lines 10-20). However,

Attorney Docket: 6550-000013
Serial No. 09/114,665

in an effort to expedite the prosecution of this case, but in no way conceding to the validity of the Examiner's rejection, Applicants have amended Claim 1 to further define rapid cooling at a rate of at least 100 °C/sec.

Applicants thus submit that the Anderson et al. reference does not disclose, teach or suggest the method of the present invention for producing an *in situ* composite solder. Applicants therefore request withdrawal of the rejection.

35 U.S.C. §103

The Examiner has rejected Claim 7 under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 5,527,628 to Anderson et al. in view of Gibson et al. Applicants respectfully traverse and request reconsideration.

As discussed above, the Anderson et al. reference does not disclose, teach or suggest the present invention, particularly the requirement for rapidly cooling the melted mixture of solder and intermetallic phase components at a rate of at least 100 °C/sec. The Gibson et al. reference teaches that 20 volume % intermetallic phase improves fatigue resistance of a solder. However, the Gibson et al. reference is not enabling because it does not teach a *method* for making such a solder.

Therefore, neither the Anderson et al. or Gibson et al. references, alone or in combination, teach or suggest a method for producing a composite solder comprising a step of rapidly cooling the non-solid composite solder mixture. Applicants thus request withdrawal of the rejection.

The Examiner has also rejected Claims 10-13 under 35 U.S.C. §103 as being unpatentable over Anderson et al. in view of U.S. Patent No. 5,520,752 to Lucey, Jr. et al.

Attorney Docket: 6550-000013
Serial No. 09/114,665

Applicants respectfully traverse and request reconsideration.

Neither the Anderson et al. or Lucey, Jr. et al. references teach or suggest rapidly cooling a melted solder mixture at a rate of at least 100 °C/sec to form a composite solder. Nor do they teach or disclose the advantages of using such a rapid cooling step so that one skilled in the art would be motivated to use such a step in producing a composite solder.

Applicants thus submit that neither the Anderson et al. or Lucey, Jr. et al. references teach or suggest the method of producing a composite solder of the present invention. Applicants therefore request withdrawal of the rejection.

The Examiner has further rejected Claims 1-6, 8-10 and 15 under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 5,863,493 to Achari et al.

The Achari et al. reference teaches lead free solders having intermetallic phases. A small amount of nickel and/or copper is added to the other elements and the solder is then formed. However, the Achari et al. reference does not teach or suggest that the components of the intermetallic phase can be added to a preformed solder. More importantly, the Achari et al. reference does not teach any specific cooling step in making the disclosed solder, and specifically, not rapidly cooling at a rate of at least 100 °C/sec.

Thus, the Achari et al. reference does not teach or suggest the method of the present invention and Applicants therefore request withdrawal of the objection.

Attorney Docket: 6550-000013
Serial No. 09/114,665

CONCLUSION

Applicants respectfully submit that the claims now stand ready and in condition for allowance and such allowance is courteously solicited. Should the Examiner have any questions or wish to further discuss this matter, it is respectfully requested that the undersigned agent be contacted at (248) 641-1600.

Respectfully submitted,

Dated: 3/1/00

By: Barbara S. Gibbs
Barbara S. Gibbs, Ph.D.
Reg No. 44,708
Agent For Applicants

Harness, Dickey & Pierce, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

BSG/gmp
Enclosures